

## Claims

- [1] A solvent-free polymer electrolyte comprising:  
 a porous film having a first surface and a second surface, the porous film comprises a reticulated network of channels formed between pores on the first and second surfaces, and is made of a mixture comprising a first polymer and a second oligomer, the first polymer being at least one selected from the group consisting of poly(vinylidene fluoride-co-hexafluoropropylene) copolymers, polyvinylidenefluorides, polymethylmethacrylates, polyacrylonitriles, polyethyleneoxides, and celluloses having a polyether chain, the second oligomer being at least one selected from the group consisting of poly(ethylene oxide-co-ethylene carbonate) copolymers with at least one terminal groups substituted by a halogen atom and polyethyleneglycols with at least one terminal groups substituted by a halogen atom, and each of the first polymer and the second oligomer being present in the mixture in an amount capable of forming a single phase; and  
 an electrolyte present in the pores of the porous film and comprising the second oligomer and a lithium salt.
- [2] The solvent-free polymer electrolyte of claim 1, wherein the weight ratio of the first polymer to the second oligomer is in the range of 95 :5 to 35 :65.
- [3] The solvent-free polymer electrolyte of claim 1, wherein in the poly(ethylene oxide-co-ethylene carbonate) copolymer, the molar ratio of ethylene oxide unit to ethylene carbonate unit is in the range of 9:1 to 1:9.
- [4] The solvent-free polymer electrolyte of claim 1, wherein the lithium salt is at least one selected from the group consisting of  $\text{LiPF}_6$ ,  $\text{LiBF}_4$ ,  $\text{LiClO}_4$ ,  $\text{LiCF}_3\text{SO}_3$ ,  $\text{LiC}_4\text{F}_9\text{SO}_3$ ,  $\text{LiN}(\text{CF}_3\text{SO}_2)_2$ ,  $\text{LiAsF}_6$ , and  $\text{LiN}(\text{SO}_2\text{C}_2\text{F}_5)_2$ .
- [5] The solvent-free polymer electrolyte of claim 1, wherein the porous film and/or the electrolyte further comprises an inorganic filler.
- [6] The solvent-free polymer electrolyte of claim 5, wherein the inorganic filler is at least one selected from the group consisting of titanium dioxide ( $\text{TiO}_2$ ), silicon dioxide ( $\text{SiO}_2$ ), alumina ( $\text{Al}_2\text{O}_3$ ), lithium aluminate (gamma - $\text{LiAlO}_2$ ), and zeolite.
- [7] A secondary battery comprising:  
 an anode comprising a carbonaceous material;  
 a cathode comprising a compound enabling intercalation and deintercalation of lithium; and  
 a solvent-free polymer electrolyte interposed between the cathode and the anode, wherein the solvent-free polymer electrolyte comprises:

a porous film having a first surface and a second surface, the porous film comprises a reticulated network of channels formed between pores on the first and second surfaces, and is made of a mixture comprising a first polymer and a second oligomer, the first polymer being at least one selected from the group consisting of poly(vinylidene fluoride-co-hexafluoropropylene) copolymers, polyvinylidene fluorides, polymethylmethacrylates, polyacrylonitriles, polyethyleneoxides, and celluloses having a polyether chain, the second oligomer being at least one selected from the group consisting of poly(ethylene oxide-co-ethylene carbonate) copolymers with at least one terminal groups substituted by a halogen atom and polyethyleneglycols with at least one terminal groups substituted by a halogen atom, and each of the first polymer and the second oligomer being present in the mixture in an amount capable of forming a single phase; and  
 an electrolyte present in the pores of the porous film and comprising the second oligomer and a lithium salt.

- [8] The secondary battery of claim 7, wherein the weight ratio of the first polymer to the second oligomer is in the range of 95:5 to 35:65.
- [9] The secondary battery of claim 7, wherein in the poly(ethylene oxide-co-ethylene carbonate) copolymer, the molar ratio of ethylene oxide unit to ethylene carbonate unit is in the range of 9 :1 to 1: 9.
- [10] The secondary battery of claim 7, wherein the lithium salt is at least one selected from the group consisting of  $\text{LiPF}_6$ ,  $\text{LiBF}_4$ ,  $\text{LiClO}_4$ ,  $\text{LiCF}_3\text{SO}_3$ ,  $\text{LiC}_4\text{F}_9\text{SO}_3$ ,  $\text{LiN}(\text{CF}_3\text{SO}_2)_2$ ,  $\text{LiAsF}_6$ , and  $\text{LiN}(\text{SO}_2\text{C}_2\text{F}_5)_2$ .
- [11] The secondary battery of claim 7, wherein the porous film and/or the electrolyte further comprises an inorganic filler.
- [12] The secondary battery of claim 11, wherein the inorganic filler is at least one selected from the group consisting of titanium dioxide ( $\text{TiO}_2$ ), silicon dioxide ( $\text{SiO}_2$ ), alumina ( $\text{Al}_2\text{O}_3$ ), lithium aluminate ( $\gamma\text{-LiAlO}_2$ ), and zeolite.
- [13] The secondary battery of claim 7, wherein the compound enabling intercalation and deintercalation of lithium is at least one selected from the group consisting of  $\text{LiCoO}_2$ ,  $\text{LiMnO}_2$ ,  $\text{LiNiO}_2$ ,  $\text{LiCrO}_2$ , and  $\text{LiMn}_2\text{O}_4$ .